ALTERNATIVES REVIEW

ALTERNATIVE 1, "THE EXISTING THROUGH DELTA SYSTEMS"

This system is limited by the capacity of the north Delta to pass flows into the south Delta without experiencing tidal reversals in the western Delta. As such, significant limitations on operational flexibility would continue to impact both the CVP and the SWP export capability. The second and third alternatives make minor improvements to the export capability by modifying the location of the intake gates and minor channel improvements.

ALTERNATIVE - 1A

This alternative involves the re-operation of the existing CVP and SWP facilities in the Delta. It assumes that the existing fish protective facilities will be brought up to their original design standards, but will not be significantly improved.

In short, this is a continuation of the status quo, although existing limitations on exports may be lifted. Should this happen, and exports during the late spring and summer increase, we could expect striped bass (eggs, larvae and juveniles) to suffer more entrainment losses through lower louver efficiencies. This will result in an increase in the losses of young of the year striped bass. Further, an increase in the numbers of fish lost to predation in Clifton Court Forebay could also be anticipated.

Recommendation - Keep in the process as the "no project alternative," from the fish facilities perspective.

ALTERNATIVE - 1B

This alternative combines the previous alternative with CVP and SWP Improvements. The CVP improvements include a connection between the Delta Mendota Canal and Clifton Court Forebay with two radial gates (10,300 cfs capacity), and new state-of-the-art fish screens at the Tracy Fish Protective Facility (on Old River). The SWP improvements would include a new intake at the north end of Clifton Court Forebay, new state-of-the-art fish screens at the J.E. Skinner Fish Protective Facility, and a new gate (presumably at the site of the existing radial gates onto Clifton Court Forebay). As an option, a new state-of-the-art fish screen may be placed at the head of the CCF in lieu of an upgraded facility at the existing site. This option implies that the intertie between the CVP and SWP screen facilities would need to be behind both facilities.

This plan, in retrospect, clearly anticipates the diversion of up to 15,000 cfs (plus additional flows from tidal filling) from two locations. The first is the CVP intake at Old River, the second is through the enlarged intake to Clifton Court.

Screening an average of 15,000 cfs at the CVP intake on Old River would entail a new

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fish screen capable of handling approximately 30,000 cfs at high tides unless flow control structures are added. It is difficult to envision such a facility in the available space unless one of the new high velocity fish screens is proposed for the site. These screens (Eicher or MIS screens) have not been proven for the mix of species present in the Delta, and would present substantial issues for the fishery agencies.

State-of-the-art fish screens (i.e. positive barrier screens) at the site of the J.E. Skinner Fish Protective Facility are more feasible, due to the space available. However, the gains in fish screening efficiency would have to be balanced against the known predation losses in Clifton Court Forebay. These concerns led the Fish Facility Team to recommend new state-of-the-art fish screens at a new intake on the north end of Clifton Court Forebay.

The exact sizing of a fish screen and necessary flow control devices would depend on operations studies and modeling of the tidal amplitudes and CCF storage requirements, work which is yet to be done.

This alternative requires more gates and hydraulic control than stated in the documents. Allowing complete flow control flexibility will be necessary to equalize water levels, prevent pump cavitation and allow for good hydraulic conditions at the fish facilities (especially if located ahead of the forebay).

Two, larger intakes will likely make the South Delta water level/quality impacts more difficult to deal with due to increased CCF filling.

Fish entrainment through the nearly adjacent dual intakes will have little fishery differences with the increased draw of water into the South Delta. It is anticipated that there will be even less of a difference with the construction of barriers, i.e. both draw from the same basic source water.

Recommendation - Modify to provide one fish screen complex at the head of Clifton Court Forebay, as recommended by the Fish Facilities Team, or abandon the alternative. We do not believe the fish entrainment at these two sites to be all that different (especially if the barriers are installed) and may not justify the expense and complications of two, full-sized facilities.

ALTERNATIVE - 1C

This alternative combines the previous components with south Delta improvements to improve conveyance capacities in the south Delta channels and improve water surface elevations and water quality in the southeastern portion of the Delta. Fish facilities concerns would be the same as for Alternative 1B, although the addition of the "flow control structures" could require fish passage facilities. Studies of the interim barriers in the south Delta should provide the information necessary to address these issues.

One advantage of the barriers is that it could provide more flexibility in South Delta water levels management and therefore more flexibility in the fish facility operations. This is in part to a

longer allowable CCF filling cycle.

Additional systemwide storage may allow more flexibility in reducing potential fish entrainment losses, if storage can take you through those periods.

Recommendation - Modify to provide one fish screen complex at the head of Clifton Court Forebay, as recommended by the Fish Facilities Team, or abandon the alternative.

ALTERNATIVE 2, "THE IMPROVED THROUGH DELTA SYSTEMS"

These proposals all include features intended to remove the channel capacity constraints which limit the transfer of water across the Delta to the export pumps. This would improve flexibility for operations at present export levels, and would accommodate significant increases in exports from the Delta.

ALTERNATIVE - 2A

This alternative assumes a new 10,000 cfs screened intake from the Sacramento River at "Hood," with North and South Delta channel improvements. The alternative incorporates a new intake structure to Clifton Court Forebay, but does not address the fish facilities in the south Delta, nor does it provide a connection between the CVP and SWP facilities in the south Delta.

The open conveyance system, coupled with a fish screen at "Hood" will present major upstream migrant passage problems. These can be addressed, but will complicate the facilities and increase costs. Further, limiting this screened intake to 10,000 cfs means that the balance of the water (up to 5,000 cfs) could come from the Delta Cross-channel/Georgiana Slough complex. This would mean that the fish screened at "Hood," and concentrated in the water remaining in the Sacramento River, would face an unscreened diversion lower in the system. Although cross Delta flows (and presumably fish) may be proportionally less, these fish will be exposed to cross Delta losses according to USFWS salmon survival studies.

The reliance of the existing fish protective facilities in the south Delta has the same limitations as those discussed in Alternative 1. In addition, the south Delta improvements will have the same problems as discussed earlier.

Recommendation - Increase the size of the screened intake at "Hood" to accommodate the full 15,000 cfs, and close the Delta Cross-channel/Georgiana Slough Complex. Add a boat lock and fish passage complex to the intake site, and eliminate the use of Snodgrass Slough as a part of the canal (this seems in conflict with the existing undisturbed wetland area and it's protection). Impacts of moving water through this existing channel could be significant. In addition, incorporate new fish screens at the head of Clifton Court Forebay in the south Delta and connect the CVP to the screened water in Clifton Court Forebay. Since most of these improvements are contained in Alternative 2B, abandon this alternative.

This modified alternative would look much like the one proposed by Pete Chadwick in an exchange of e-mail earlier this year (See attachment).

ALTERNATIVE - 2B

This alternative is much like Alternative 2A, with the south Delta fish facility improvements. As such it suffers from the same north Delta shortcomings of that alternative. The south Delta fish facility improvements are identical to those in Alternatives 1B and 1C, and suffer from the same problems.

Recommendation - Incorporate the 15,000 cfs north Delta fish screen recommendation from Alternative 2A, and the south Delta fish screen recommendations from Alternative 1C. Close the Delta Cross-channel/Georgiana Slough complex, and provide boat locks and fish passage facilities for upstream migrants. Abandon the use of Snodgrass Slough as a conveyance channel.

ALTERNATIVE - 2C

This alternative cannot stand alone, and is now incorporated into the new Alternative 3I. As discussed earlier, this alternative assumes the use of the existing CVP and SWP fish screens, with the same concerns described in the review of Alternative 1. The predation losses would be expected to increase due to the additional area of "forebay" created by the three arms.

The western arm would take out about one third of the Holland Tract "Habitat Island" proposed as wildlife mitigation habitat for the Delta Wetlands project impacts. This would have to be resolved before either project moved forward.

Recommendation - Although it may be costly, (from and O&M and capital expenses point of view), we believe that the three intake arms should be screened for much of the same reasons as we recommend the intake to the CCF be screened. Operationally, hydraulically controlling the three "arms" on a real time basis will be difficult. These intake screens will require elaborate flow control structures for the intake facilities to operate within reasonable flow limits (tidal filling could be in excess of present CCF inflows). Allowing the fish salvage facilities to remain at their existing locations will suffer from the same problems as listed for Alternative 1 configurations.

If this alternative is carried forward, consider as Alternative 3I.

ALTERNATIVE - 2D

This alternative is identical to Alternative 2B from a fish facilities point of view. As such it shares the same concerns. In addition, the creation of large amounts of "shallow aquatic habitat" along the migratory corridors leading to and from the Mokelumne River could present major problems to anadromous fish migrating into and out of the Mokelumne River system.

Additional considerations should be given to the consolidation and screening of the agricultural diversion sites adjacent to new setback levees.

Recommendation - Abandon, Alternative 2B has a more reasonable configuration.

ALTERNATIVE - 2E

This alternative assumes that water can be diverted from the Sacramento River onto the Delta islands (which become a conveyance corridor) without fish screens. The alternative further assumes that fish diverted from the Sacramento River will survive on the flooded islands. The presence of large amounts of water from the Sacramento River in the central Delta would add to the attraction and confusion of upstream migrants, adding to these problems in the Delta. Additional considerations should be given to the consolidation and screening of the agricultural diversion sites adjacent to new setback levees.

Recommendation - Abandon, since it cannot be modified to be "fish facilities friendly."

ALTERNATIVE 3, "THE ISOLATED CONVEYANCE SYSTEMS"

These alternatives all accomplish the same objective of Alternative 2, but include some component of an isolated system to transfer water from the Sacramento River to the export pumps. The range of facilities include an open channel, a closed pipeline, and a "chain of lakes."

ALTERNATIVE - 3A

This alternative uses a 5,000 cfs "isolated conveyance facility," and increased diversion capacity in the south Delta with the existing CVP/SWP fish screens. As discussed earlier, since this alternative would depend on up to 10,000 cfs of Sacramento River water from the Delta Cross-channel/Georgiana Slough complex, it would not be compatible with the recommendations of the Fish Screen Team. It is recognized that reducing cross delta flows may be incrementally beneficial for Sacramento River and Delta fish, however, continuing a disproportionate reliance on the South Delta fish facilities to collect and haul fish (entrained into this area via the cross delta flows) away from a dead end area is a poor compromise to the system. The benefits to an isolated system go beyond improved fish facility operations and function to include water quality, reliability, operational flexibility, in-Delta storage and other benefits.

Recommendation - Abandon this alternative as incomplete and inconsistent with the objectives of the fish facilities.

ALTERNATIVE - 3B

This alternative is identical to Alternative 2A, with the addition of new and improved fish facilities for the CVP/SWP. Since the fish facilities are in the same locations as presently built, the alternative suffers from the same problems as described for Alternative 1B.

Recommendation - Better than 3A, but questionable overall fish facility benefits. Increase the screened diversion on the Sacramento River, even if only 5,000 cfs is isolated.

ALTERNATIVE - 3C

This alternative is identical to Alternative 3B except for the use of a buried pipeline.

Recommendation - See 3B. The use of a buried pipeline does not change things from a fish facility point of view or to resolve the fish facilities concerns described earlier.

ALTERNATIVE - 3D

This alternative is identical to Alternative 3C except for the use of a buried pipeline.

Recommendation -See 3B. The use of a buried pipeline does not change things from a fish facility point of view or to resolve the fish facilities concerns described earlier.

ALTERNATIVE - 3E

This alternative is for all practical purposes the "Peripheral Canal," and is the preferred alternative of the Fish Facilities Team. As envisioned by the team, all diversions would take place through the screened intake at "Hood." Such an alternative would screen all diverted water at an optimum location, and would eliminate adult migrant straying concerns. This alternative is the least risky from a fish facility operational and performance point of view. It is consistent with the recommendation of the Fish Facility Team.

Recommendation - Carry this alternative forward and adopt it as the preferred alternative, from a fish facilities perspective.

ALTERNATIVE - 3F

This alternative combines all the worst features available, from a fish facilities perspective. The Sacramento River intake is moved downstream to an area of greater tidal reversal, and does not screen the full 15,000 cfs of CVP/SWP export capability. A number of smaller diversions in the central Delta are incorporated, and new fish screens at the site of the existing CVP/SWP fish facilities are suggested. This alternative ignores most if not all of the Fish Screen Team (and its predecessors) recommendations, and is inconsistent with the fish protection goals of the program.

Recommendation - Abandon.

ALTERNATIVE - 3G

This alternative also screens only a portion of the water diverted from the Sacramento River, and suffers from the same shortcomings in that regard. In addition, as we have already discussed, this alternatives assumes new fish facilities at the site of the existing CVP/SWP facilities.

Recommendations - See 3B.

ALTERNATIVE - 3H

This alternative screens only 5,000 cfs of the Sacramento River diversion, with the balance coming from a weir (controlled by an inflatable dam) near the Delta Cross-channel/Georgiana Slough complex. In the south Delta, new fish facilities at the sites of the existing CVP/SWP fish facilities are proposed.

Recommendation - See 3B. The combination of inadequate fish screens and the fish straying problems in the central Delta will be major obstacles to this plan.

ALTERNATIVE - 3I

This alternative incorporates a screened 15,000 cfs diversion from the Sacramento River and an isolated conveyance facility from the diversion point to the San Joaquin River. There the water is released into the San Joaquin River, and then picked up by any one of the three diversions proposed in Alternative 2C. Although Sacramento River outmigrants would be fully protected in this alternative, as long as the screened intake is used, the alternative clearly envisions diversions from the central Delta when the screened intake is out of service. In fact, this sort of alternative could allow an instantaneous draft of about 30,000 cfs from the system, as the canal is recharged after a curtailment, and the pumping demands were met from the other intakes.

The operational considerations and hydraulic impacts of this alternative will be very complex. Because the goal is flexibility, it may be necessary to screen each of the three central delta intakes for a full diversion to avoid excessive predation and losses of San Joaquin and Delta fish. Such facilities would be difficult to hydraulically regulate with or without screens. Although this may be an extremely costly alternative, it does offer added flexibility to the system if it can be monitored and controlled.

Recommendations - Carry this alternative forward, but describe operational constraints more fully so that the timing and frequency of both the use of the three intakes in the south Delta, and the use of the 30,000 cfs diversion capacity are more fully understood.